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Dated

24 September 2003

Patents Act 1977
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Request for grant of a patent

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The Patent Office

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1.	Your reference	MJD/62324/000	0302295.1	
2.	Patent application number (The Patent Office will fill in this part)	31 JAN 2003	0302295.1 0302295.1	
3.	Full name, address and postcode of the or of each applicant (underline all surnames)	Spencer Wright Industries Inc. 1000 Tallan Building Two Union Square Chattanooga Tennessee 37402 United States of America		
	Patents ADP number (if you know it)			
	If the applicant is a corporate body, give the country/state of its incorporation	United States of America		
4.	Title of the invention	A Tufting Machine Needle		
5.	Name of your agent (if you have one)	BOULT WADE TENNANT		
	"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)	VERULAM GARDENS 70 GRAY'S INN ROAD LONDON WC1X 8BT		
	Patents ADP number (if you know it)	42001		
6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of filing (day/month/year)
7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (day / month / year)	
8.	Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	Yes		

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Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form -

Description 6

Claim(s) 1

Abstract -

Drawing(s) 4

8
4
1

10. If you are also filing any of the following, state how many against each item.

Priority documents -

Translations of priority documents -

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*) 1

Request for substantive examination (*Patents Form 10/77*)

Any other documents
(Please specify)

11

I/We request the grant of a patent on the basis of this application.

Signature

Date

Ben W. Draper

31 January 2003

12. Name and daytime telephone number of person to contact in the United Kingdom

Martyn J. Draper
020 7430 7500

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A TUFTING MACHINE NEEDLE

The present invention relates to a needle for a tufting machine.

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The tufting needle was originally developed from a sewing machine needle. In all tufting needles, a yarn protection groove is provided running along the shank of the needle to protect the thread during the needle penetration into the base fabric.

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According to the present invention there is provided a tufting machine needle without a yarn protection groove.

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The inventor has found that, contrary to conventional wisdom, the yarn protection groove is not necessary in a tufting needle and eliminating it can even provide certain advantages.

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With a yarn protection groove, the yarn crosses the wall of the yarn protection groove in an angular direction at the point of needle penetration into the backing cloth. Thus results in yarn being trapped between the needle wall and the backing cloth, and also rolls or twists the yarn during the stroke of the needle. This interruption of the yarn flow often creates unevenness on the carpet surface, especially of loop pile fabrics.

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Once the yarn has passed through the backing cloth, the yarn protection groove is unnecessary as there is no yarn restriction and adequate clearance.

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Thus, in effect, it has been found that the yarn protection groove provides little or no benefit.

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By eliminating the yarn protection groove, the needle is stronger and considerably less expensive to manufacture as it does not need to have a complex structure with varying sections of thickness. The manufacturing process can be simplified as multiple die pressing operations and can be reduced or even eliminated.

The invention also opens up the possibility of producing needles from a flat plate, suitable for moulding in a needle module, or a round bar with a machined or a flat pressed working area for single needles which are inserted into round holes drilled in a needle bar.

Also, due to the simplicity of the design, the needles can be produced using conventional machine tools, including wire erosion (EDM) instead of the special purpose machines necessary with the conventional design. The needle can also be moulded in tungsten, powder steel metallurgy and tough nylons.

The additional strength gained by eliminating the groove has resulted in smaller section needles. This, amongst other things, reduces the size of the needle penetration hole in the backing cloth which has significant advantages in tuft retention and backing cloth strength. This is particularly important when tufting into non-woven backing cloths, especially in the automotive industry where backing cloth strength is vital during the moulding operation of carpets.

Conventional needles are provided with a lead-in chamfer to allow the yarn pick-up by the hook or looper. As the yarn protection groove has been eliminated, the lead-in chamfer can be made wider and more gradual, as compared to a conventional needle

thereby improving the hook or looper pick-up.

5 In order to compensate for the elimination of the
yarn protection groove, a small chamfer may be
provided on the yarn inlet side of the needle,
although this is not believed to be necessary.
Alternatively, with a flat plate configuration, the
needle can be angled such that the plane of the flat
plate is angled with respect to the direction in
10 which, in use, the backing passes through the tufting
machine.

The invention also extends to a needle module
having a plurality of needles according to the
15 invention, and also to a tufting machine having a
plurality of needles according to the invention.

Examples of a standard tufting needle and a
tufting needle in accordance with the present
20 invention will now be described with reference to the
accompanying drawings, in which:

Fig. 1A is a cross-section through a conventional
needle;
25

Fig. 1B is a plan view of a conventional needle;

Fig. 1C is a cross-section through line C-C in
Fig. 1B;
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Fig. 1D is a cross-section through line D-D in
Fig. 1B;

Fig. 2 is a schematic showing a conventional
35 needle in use in a tufting machine;

Fig. 2A is a cross-section through line A-A in

Fig. 2.

Fig. 3 is a view similar to Fig. 2 showing a first example of the present invention;

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Fig. 3A is a cross-section through line A-A in Fig. 3;

Fig. 4 is a schematic plan view of a needle in accordance with the second example of the present invention; and

10

Fig. 4A is a cross-section through line A-A in Fig. 4.

15

The conventional needle will first be described with reference to Figs. 1 and 2. The needle has an elongate shank 1 at one end of which is an eye 2, and the other end 3 of which is mounted in a needle bar or needle module. A yarn protection groove 4 extends along the shank from a position adjacent to the mounted end 3 and into the eye 2. A hook lead in chamfer 5 is provided on the opposite side of the needle to the yarn protection groove 4. The lead-in chamfer 5 extends only along the portion of the needle adjacent to the eye 2. It can be seen, particularly from Fig. 1A that the needle has a wide variation of cross-sections along its length.

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The operation of the needle is shown in Fig. 2. The needle is shown mounted in a yarn module 6 in a tufting machine. A number of such needles are arranged perpendicular to the plane of Fig. 2. Backing cloth 7 supported on a series of support fingers 8 is then fed through a tufting machine from right to left in Fig. 2. A yarn 9 which is threaded through the eye 2 of the needle is reciprocated as the

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needle reciprocates. The yarn is picked up on each stroke by a reciprocating hook 10 to form a series of loops as is well known in the art.

5 Initially, the tip of the needle penetrates the backing cloth 7 whereupon the rest of the needle successively follows it through the backing cloth 7. When the needle has penetrated to a sufficient depth (i.e. once the eye 2 has passed through the backing
10 cloth 7), the yarn 9 starts to become trapped between the needle and the backing cloth. The yarn protection groove 4 is designed to prevent this. However, in practice, the only point at which the yarn becomes trapped is at the point where the needle passes
15 through the backing cloth 7. At this point, the yarn 9 passes around a wall 11 of the yarn protection groove, and this tends to roll or twist the yarn during the stroke. Thus, the yarn protection groove does not fulfil its intended function satisfactorily.

20 The first example of the present invention will now be described with reference to Fig. 3. This figure is similar to Fig. 2, and common elements have been designated by common reference numerals. The only
25 difference between Figs. 2 and 3, is the configuration of the needle, and, in particular, the absence of the yarn protection groove. From the cross-section of the needle shown in Fig. 3A, it is apparent that the needle is made from a flat plate. It will also be
30 seen that this flat plate is inclined with respect to the direction in which the backing cloth passes through the tufting machine.

 It will be apparent from the comparison of Figs.
35 1, 2 and 3 that the needle of the present invention has a far more uniform cross-section than a conventional needle. It should be noted that the yarn

9 passes around the edge of the needle in a similar way to the way in which it passes around the wall 11 of the yarn protection groove 4. In this sense, the invention is believed to be comparable with a
5 convention needle.

A hook lead-in chamfer 12 is provided on the needle. Owing to the absence of the yarn protection groove, this chamfer can be made larger than the
10 conventional needle.

A second example of a needle in accordance with the present invention is shown in Fig. 4 and 4A. In this case, the needle is also of flat plate
15 construction and has a hook lead-in chamfer 12. However, the flat plate is arranged generally parallel to the direction in which the backing cloth is fed through the tufting machine. A second chamfer 13, arranged at a shallower angle than the hook lead-in
20 chamfer 12, is provided to assist with the yarn entrance which, in this example, enters the needle from the left hand side rather than the right hand side as shown in Fig. 3A. However, equally, in Fig. 4A, the chamfer 13 could be provided on the lower
25 right hand surface of the yarn if the needle approaches from the same direction as in Fig. 3A.

CLAIMS

1. A tufting machine needle without a yarn
protection groove.
5
2. A needle according to claim 1 made from a flat
plate.
3. A needle according to claim 1 made from a round
10 bar.
4. A needle according to claim 1 provided with a
hook lead-in chamfer the entrance to which is the
width of at least half of the width of the needle
15 shank.
5. A needle module having a plurality of needles
according to any one of the preceding claims.
- 20 6. A tufting machine having a plurality of needles
according to any one of claims 1 to 4.

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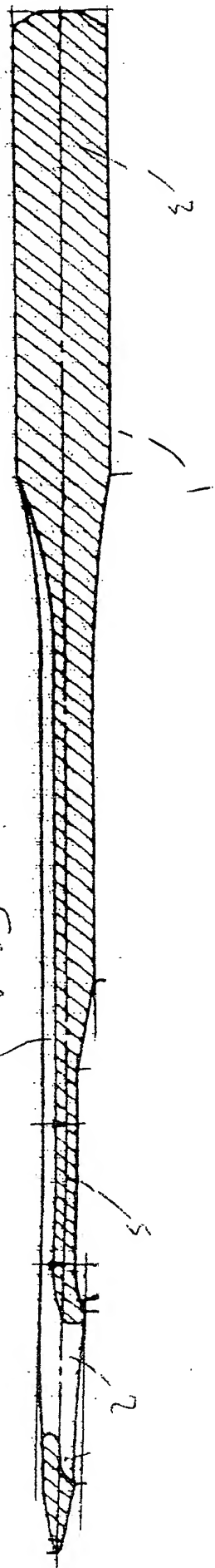


FIG 1A

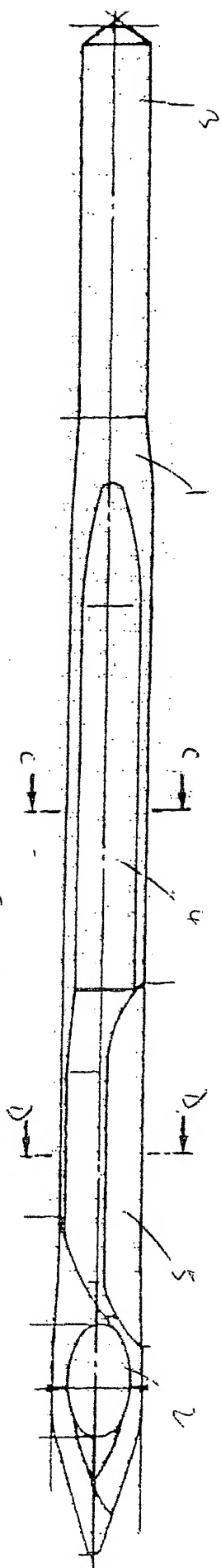


FIG 1B

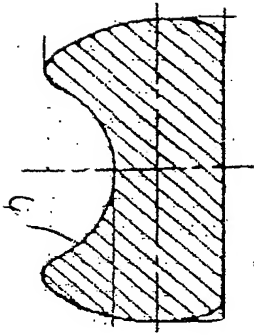


FIG 1C

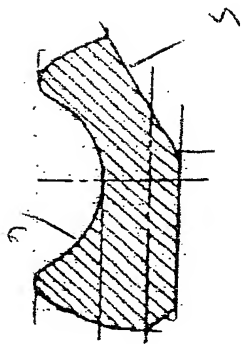


FIG 1D





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